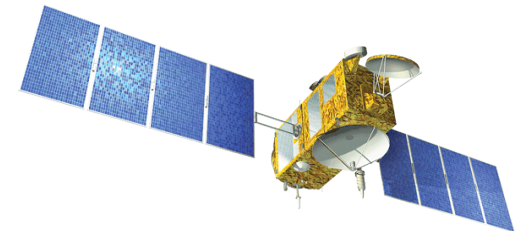
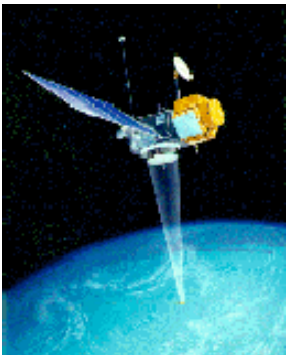




POD Modelling Improvements for OSTM, Jason-1 and TOPEX/Poseidon

N.P. Zelensky, F.G. Lemoine, D.D. Rowlands,
S.B. Luthcke, D.S. Chinn, B.D. Beckley, S.M.
Klosko, P. Willis, V. Luceri

OSTST 2009 POD Splinter
Seattle, Washington
June 22-24, 2009





Preview

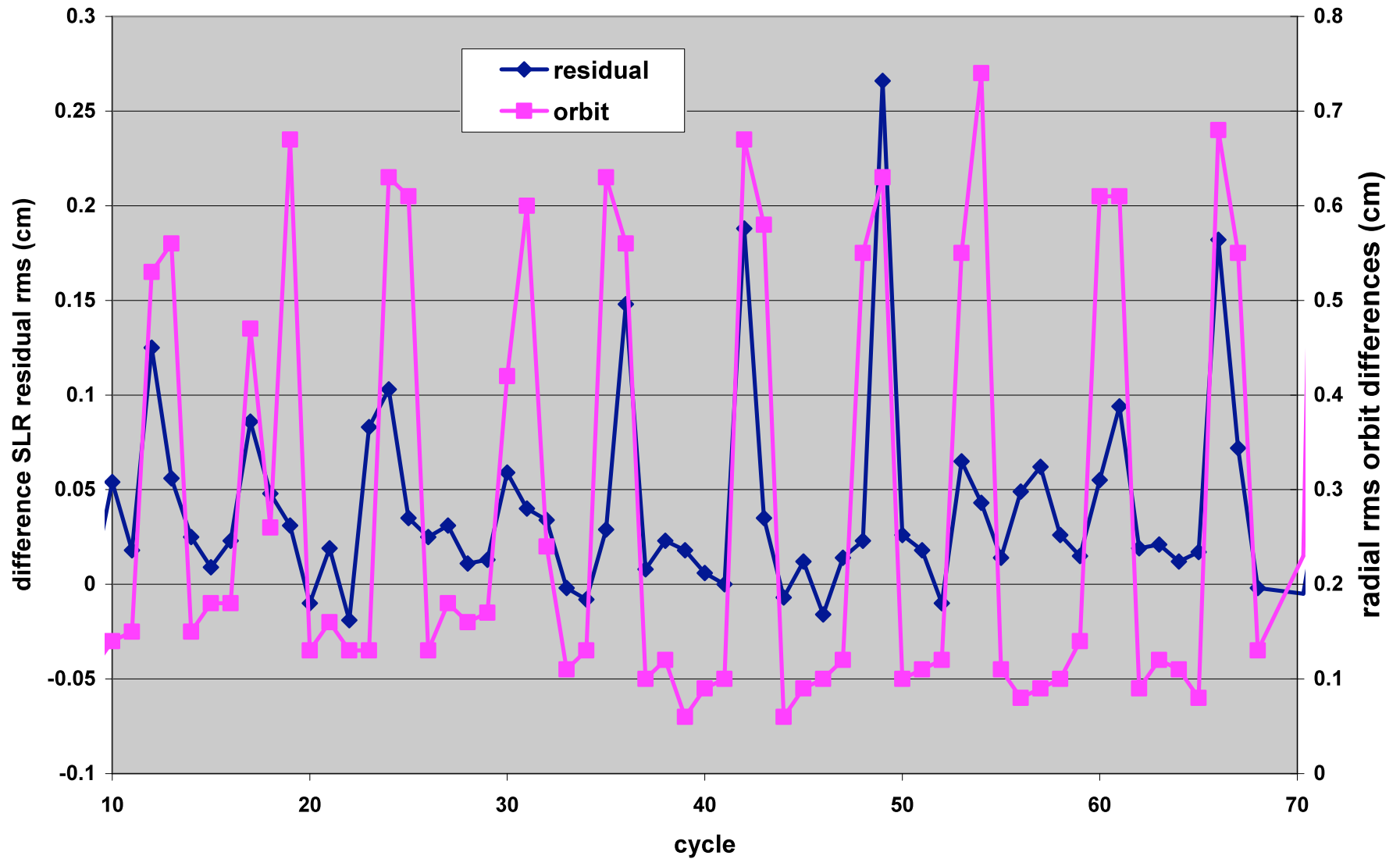
- 1 Jason-1 Radiation Pressure**
- 2 Jason-1 SAA (3) correction after cycle 260**
- 3 Time Varying Gravity**
- 4 DORIS sensitivity / troposphere modeling**
- 5 Jason-2 Radiation Pressure**



J1 SRP UCL -vs- Panel model

(+ means UCL improvement in residuals)

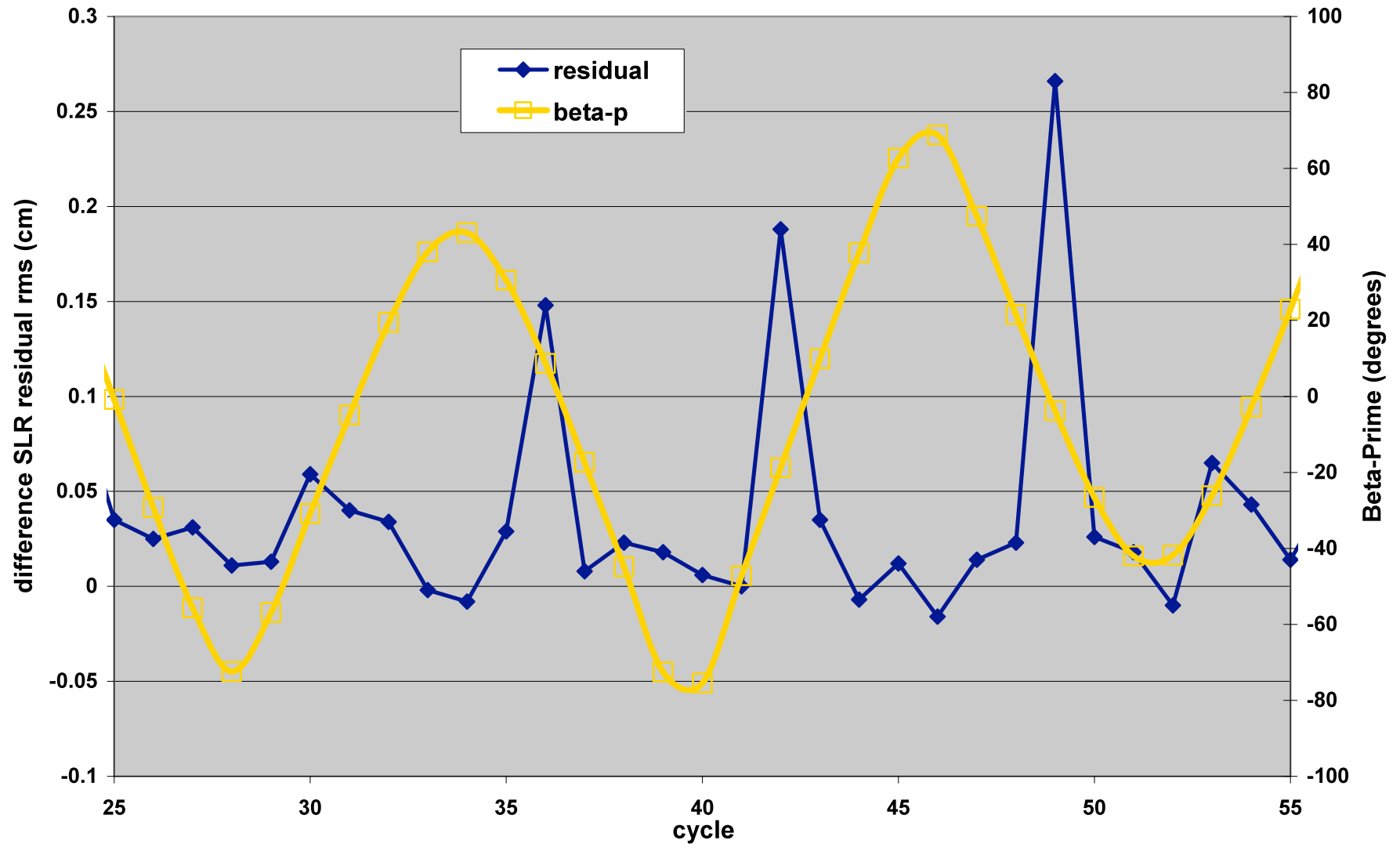
Jason-1 (panel-ucl) differences





J1 SRP UCL improvement largest over fixed-yaw regime changes

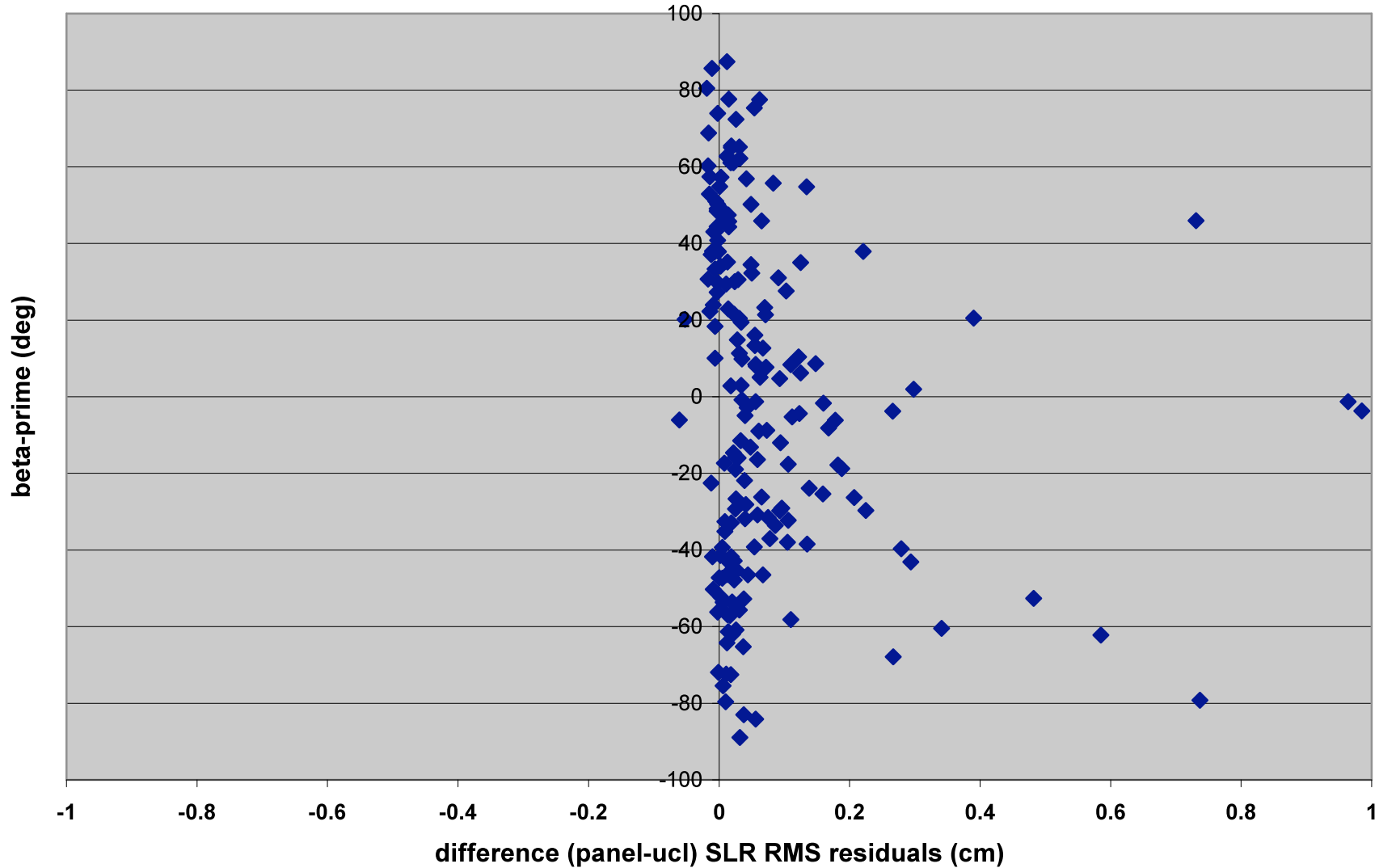
Jason-1 (panel-ucl) SLR residual rms differences





J1 SRP UCL improvement overall

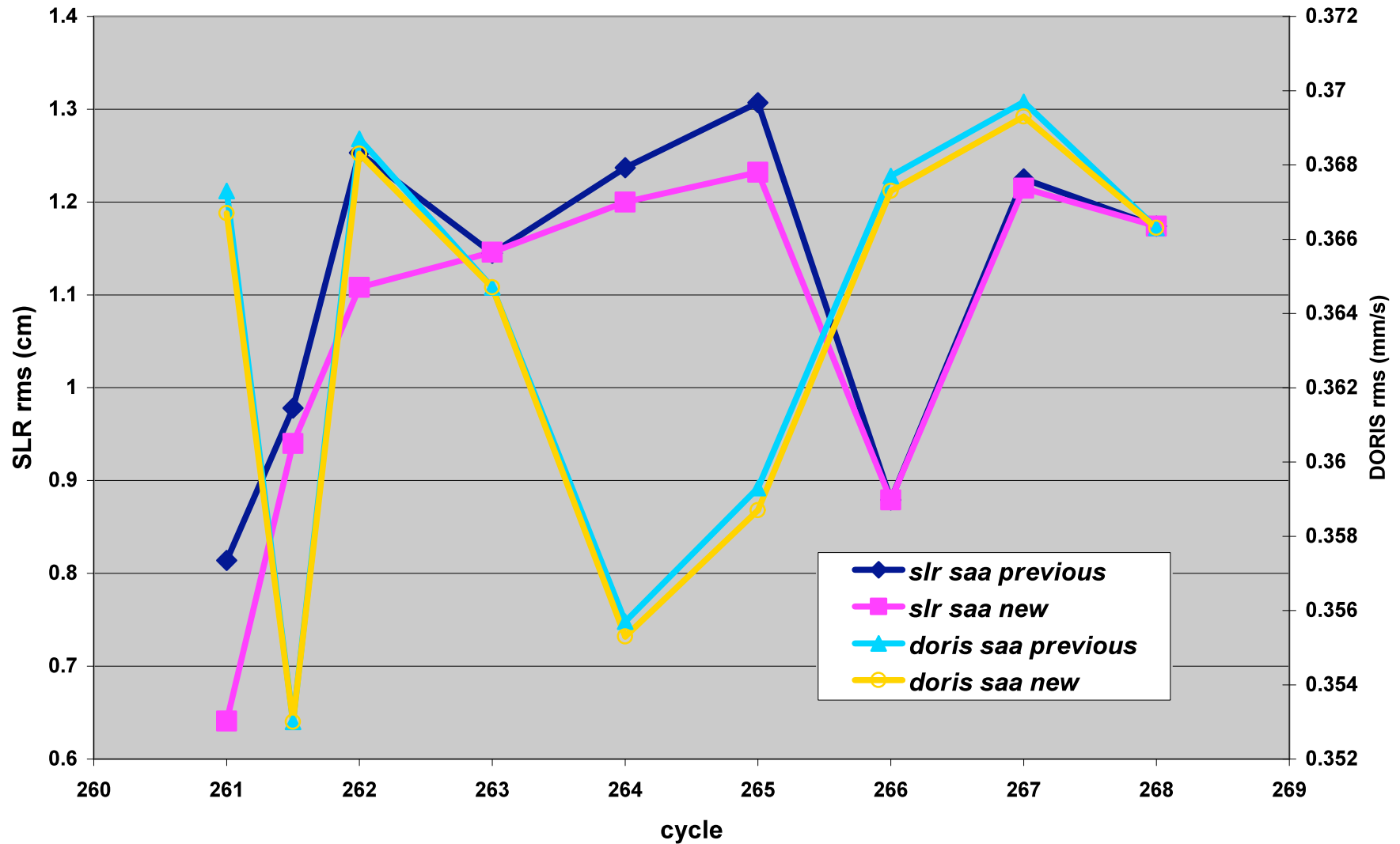
Jason-1 SLR (panel-ucl) residual differences





J1 post-cycle 260 SAA correction

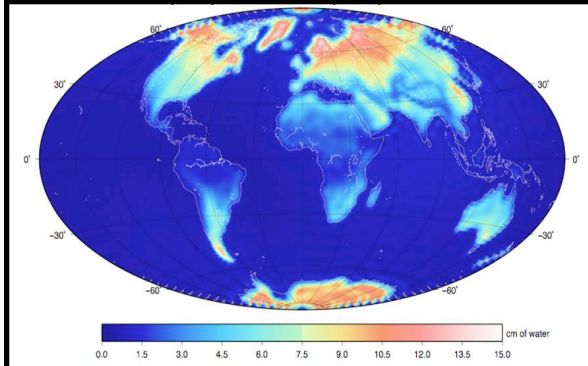
Jason-1 post-cycle 260 orbit SAA correction - SLR/DORIS orbit solution residuals



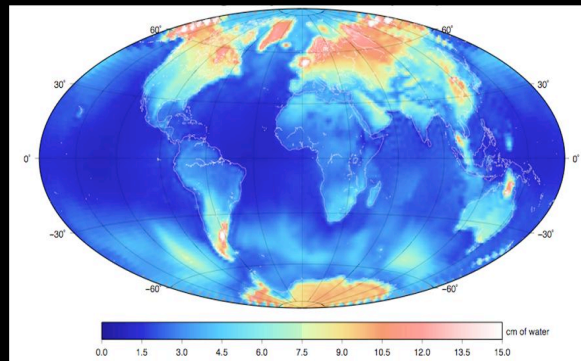


Time Varying Gravity Components

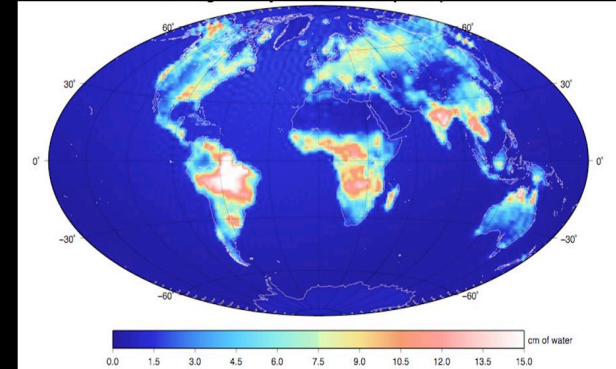
Atmospheric gravity (NCEP-6hr)



Atgrav(ECMWF-3hr)+Ocean(MOG2D)

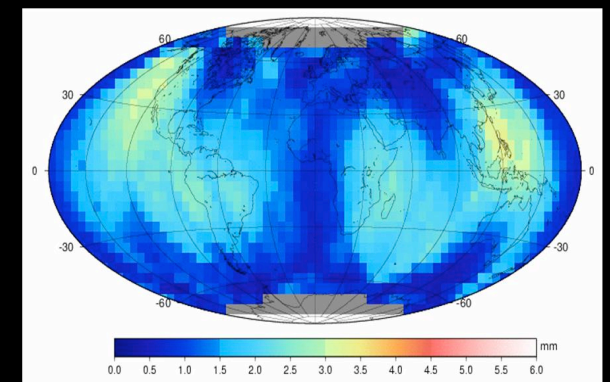
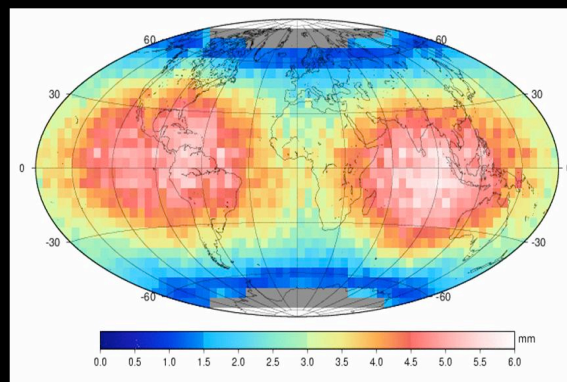
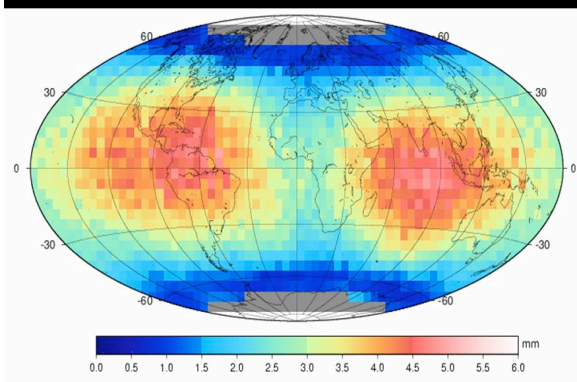


Hydrology (GLDAS)



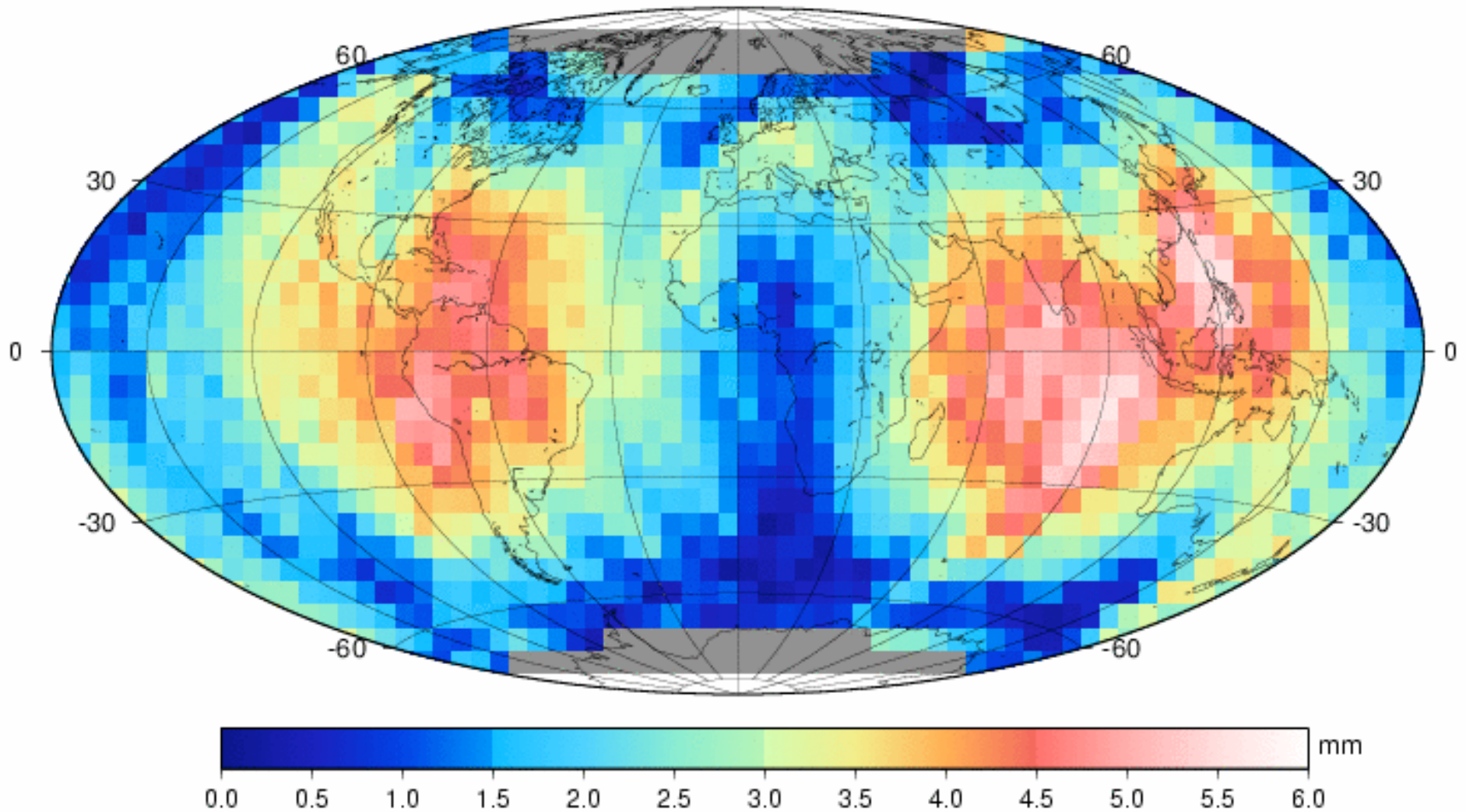
Signal (RMS cm of water)

Jason radial orbit RMS (mm)





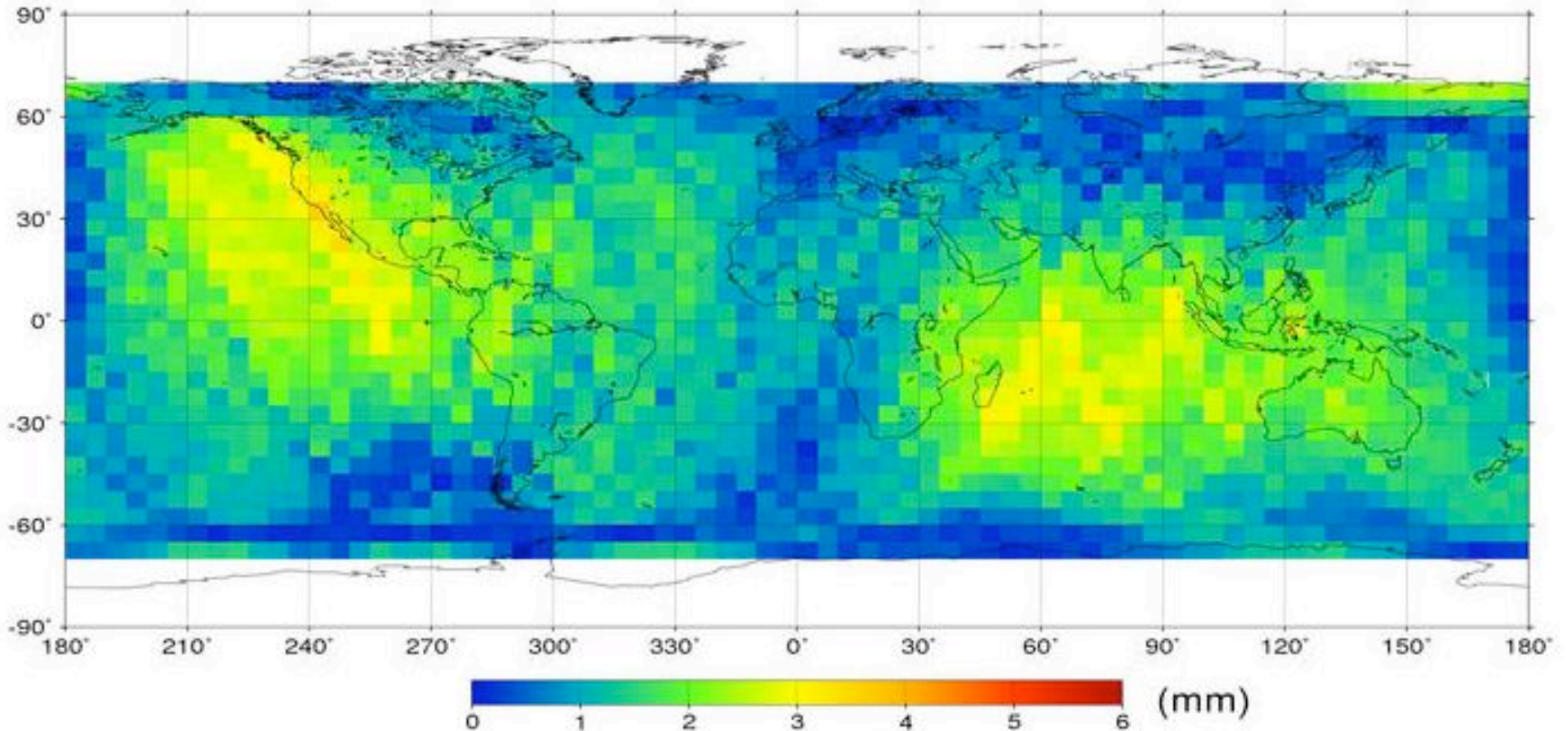
Jason1 radial 5-mm annual amplitude due to time varying gravity (operational model)





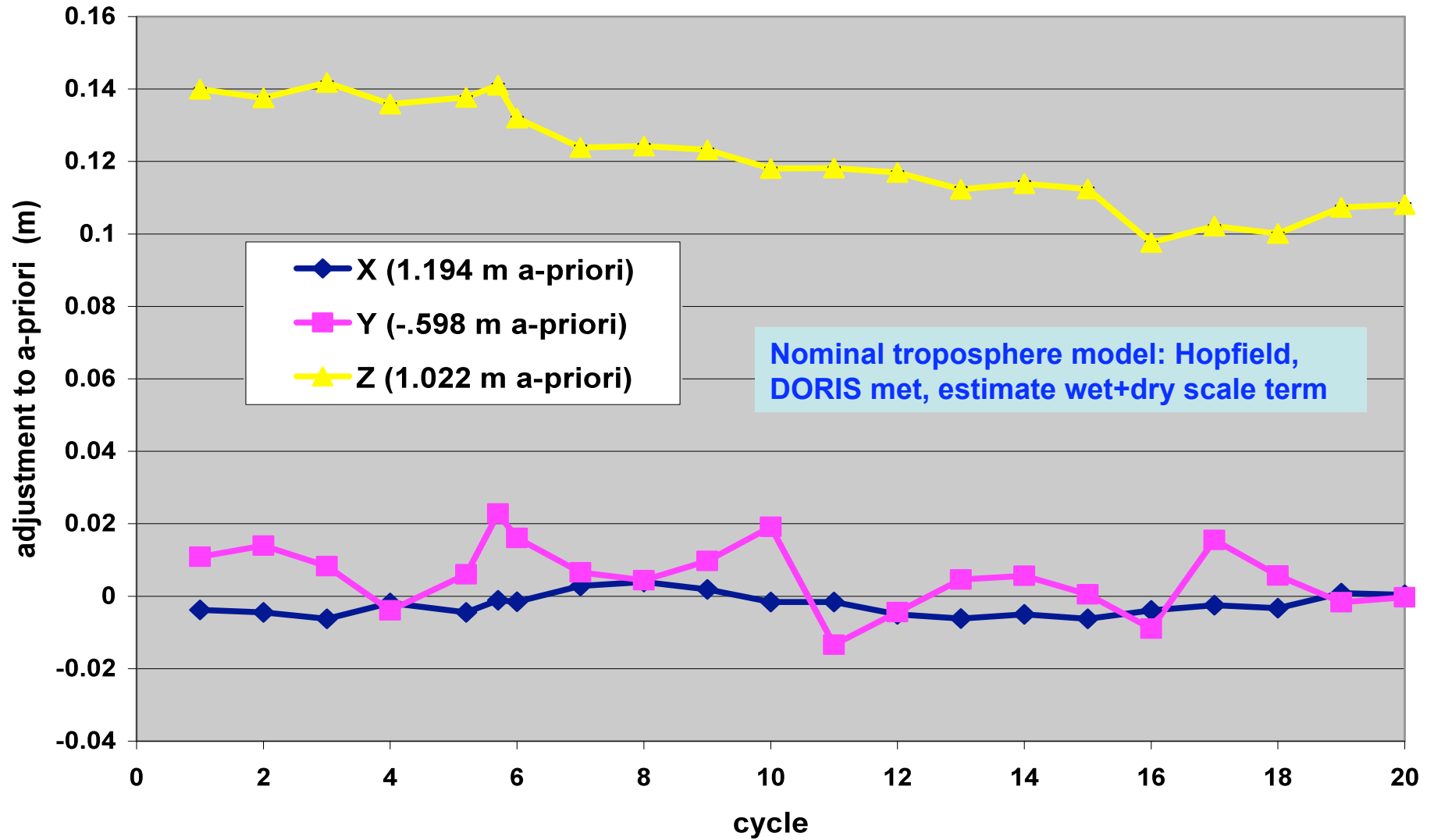
Effect of residual TVG on J1 orbit:
(operationally modeled: atgrav+annual) -
(atgrav+mog2d+gldas + est. 60x60/mo Grace)

**2.5 mm annual residual amplitude
from 5x5 degree radial orbit differences over 2004-2005**



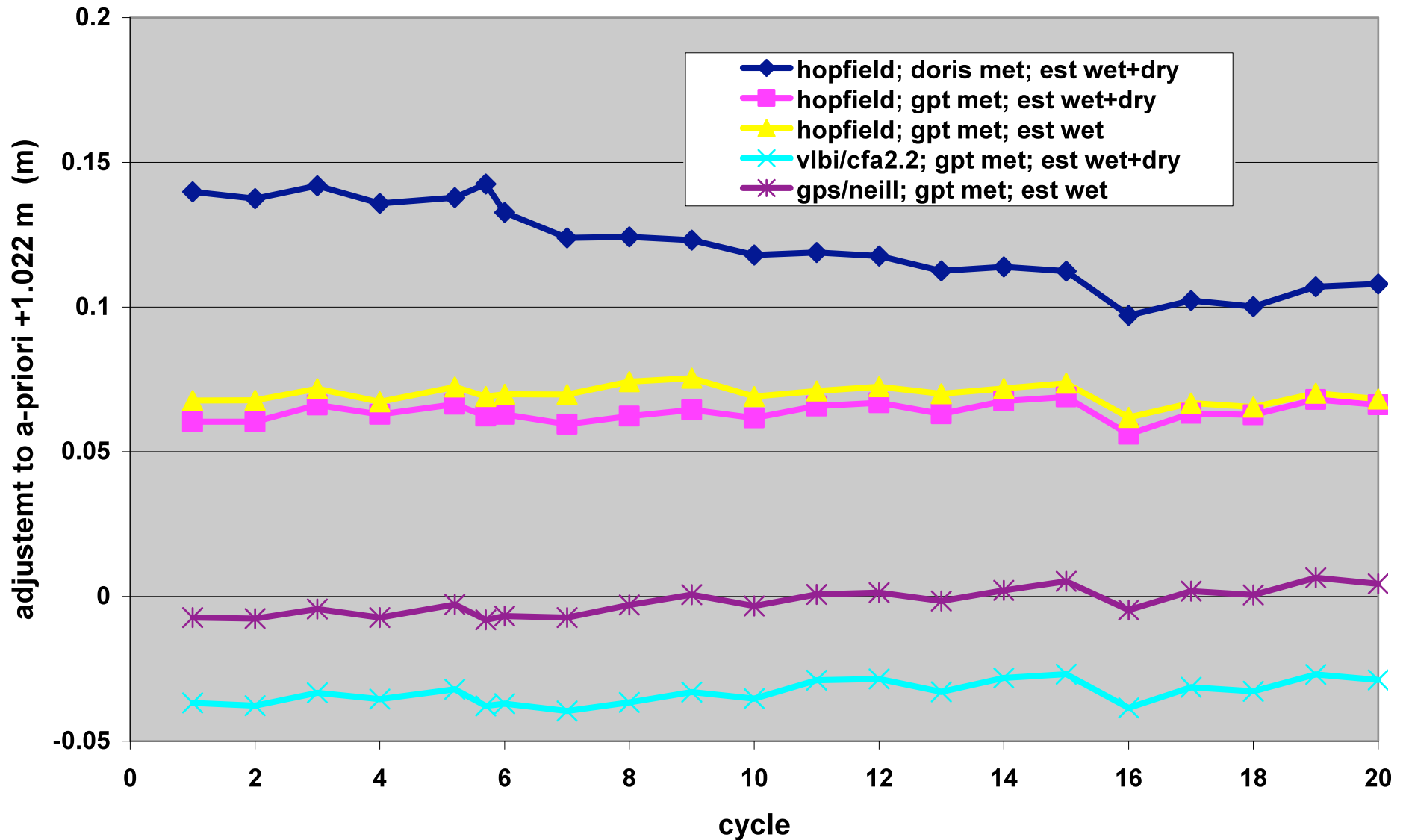


Jason-2 estimated DORIS antenna offsets



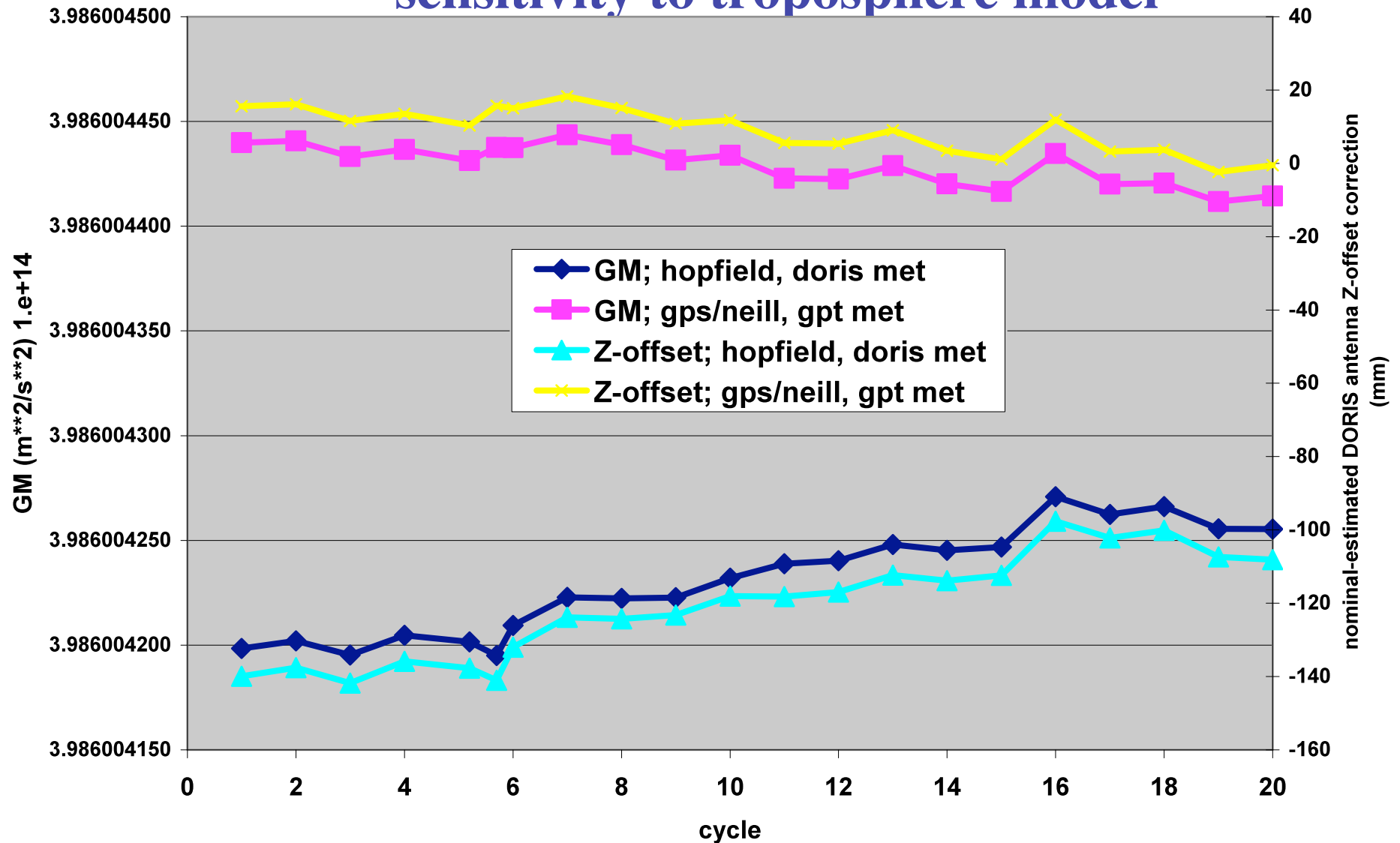


Jason-2 DORIS antenna Z-offset estimate sensitivity to troposphere modeling





Jason-2 estimated GM & Z-offset with DORIS- sensitivity to troposphere model



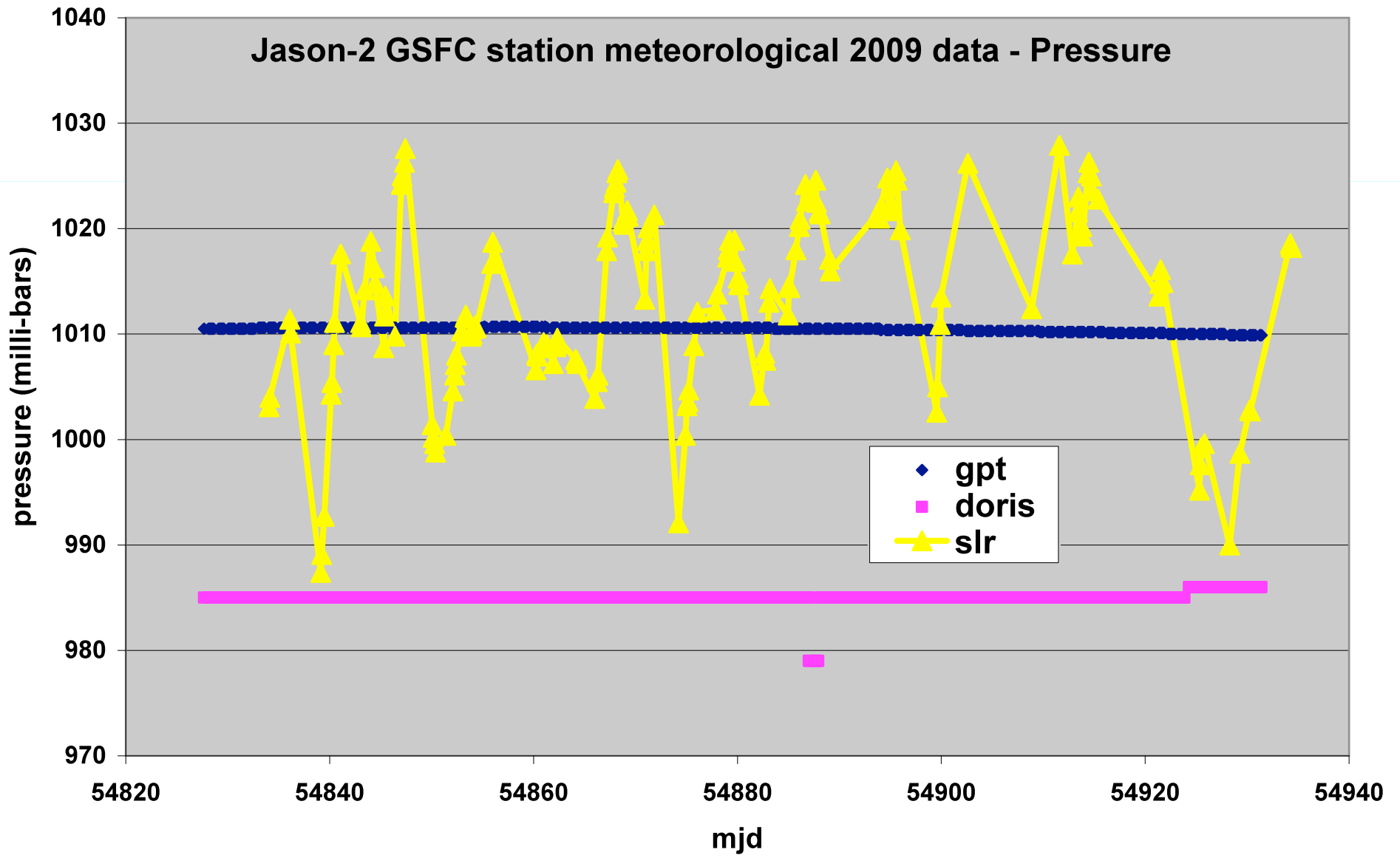


Jason-2 DORIS troposphere model tests

Jason-2 cycles 1-20 doris-only summary estimate wet+dry trop	residuals			orbit difference			
	doris (mm/s)	slr (cm)		xover (cm)	h	c	l
		mean	rms		(cm)	(cm)	(cm)
<i>std0809:</i> hopfield, doris met	0.3726	-0.408	3.235	5.592	---	---	---
<i>std0809_gpt:</i> hopfield, gpt met	0.3656	-0.224	2.645	5.593	0.06	1.58	0.27
<i>std0809_trop:</i> gps/neill, gpt met	0.3653	-0.157	2.433	5.592	0.13	2.68	0.59

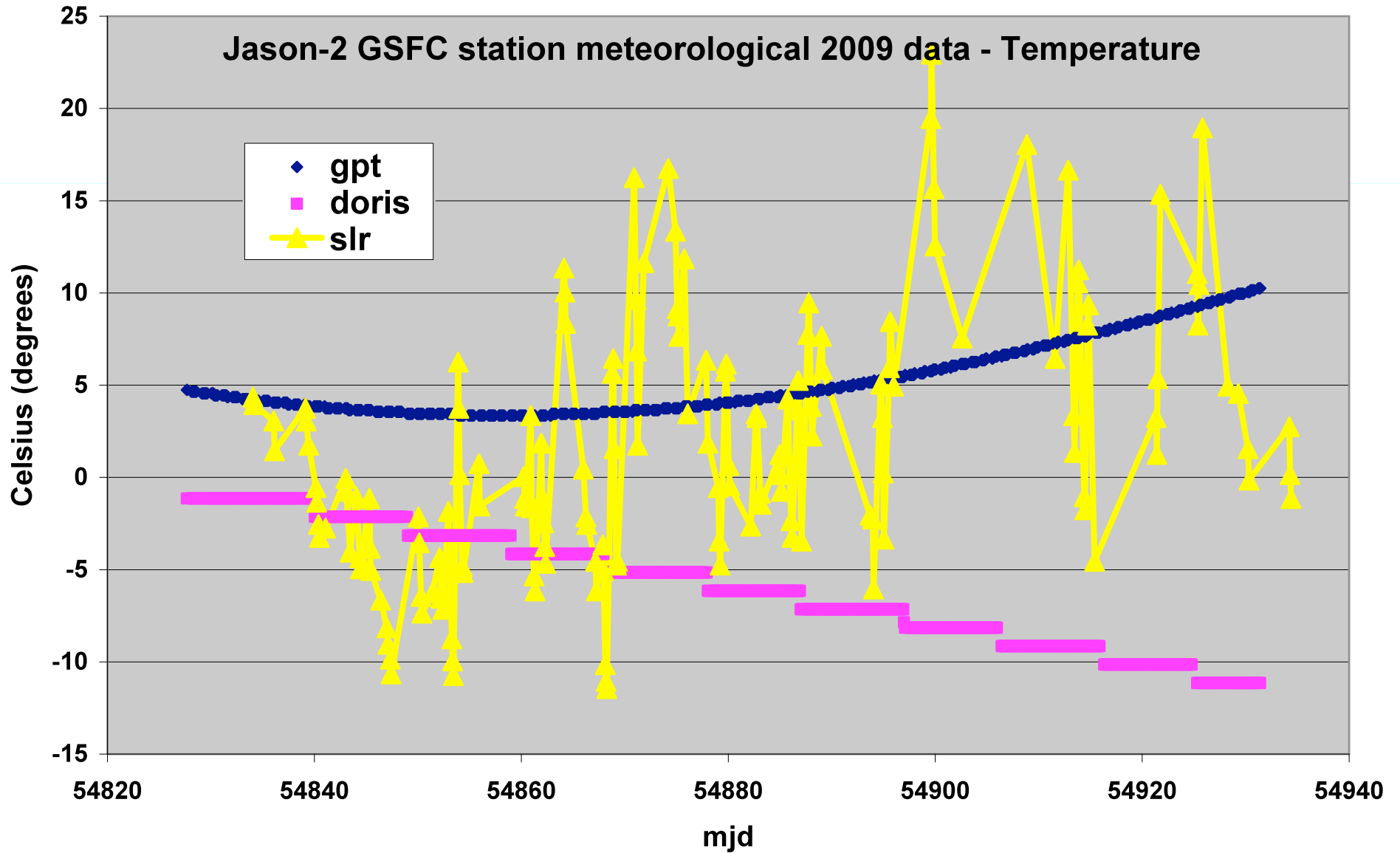


Jason-2 GSFC station - Pressure



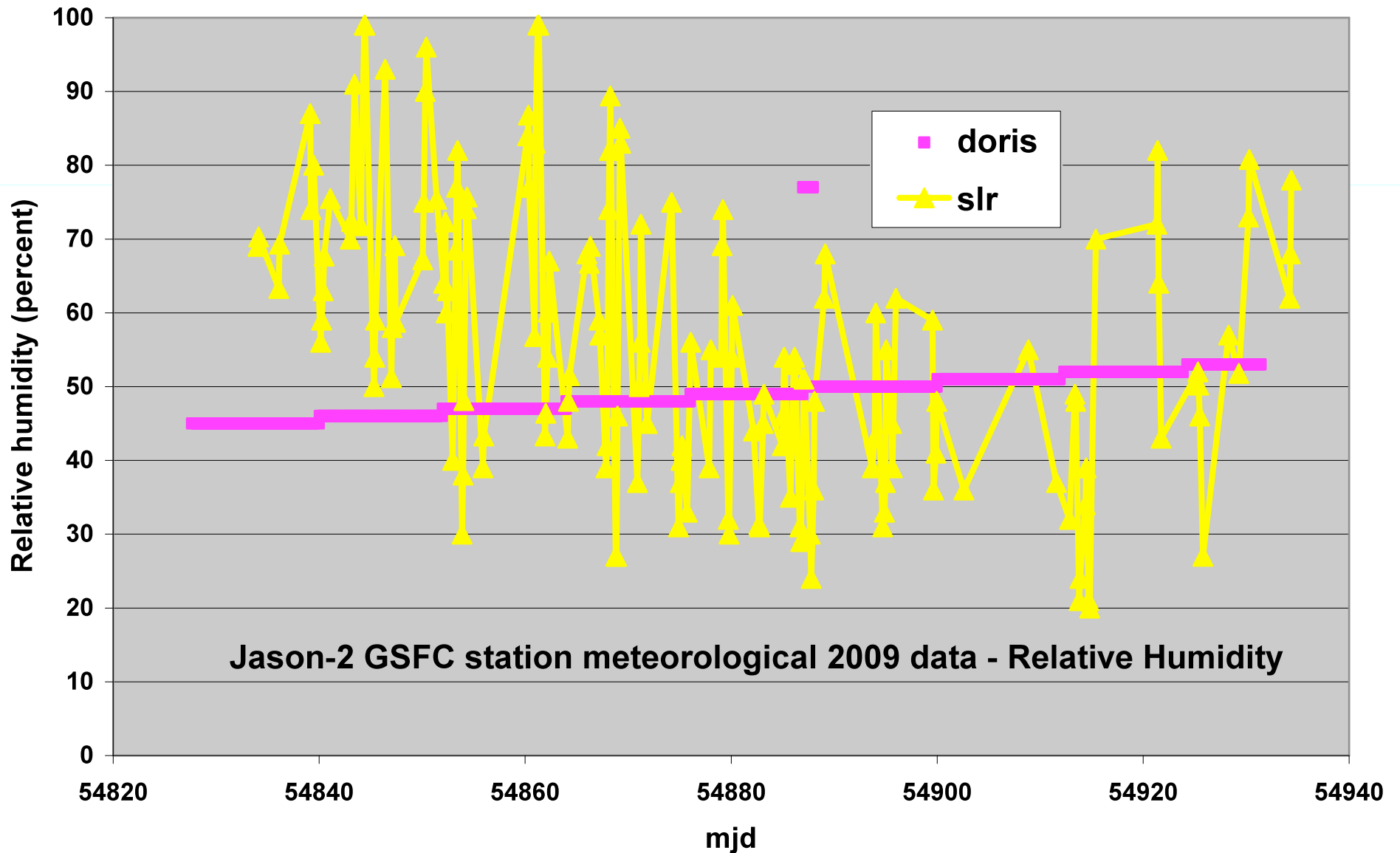


Jason-2 GSFC station - Temperature





Jason-2 GSFC station - Humidity



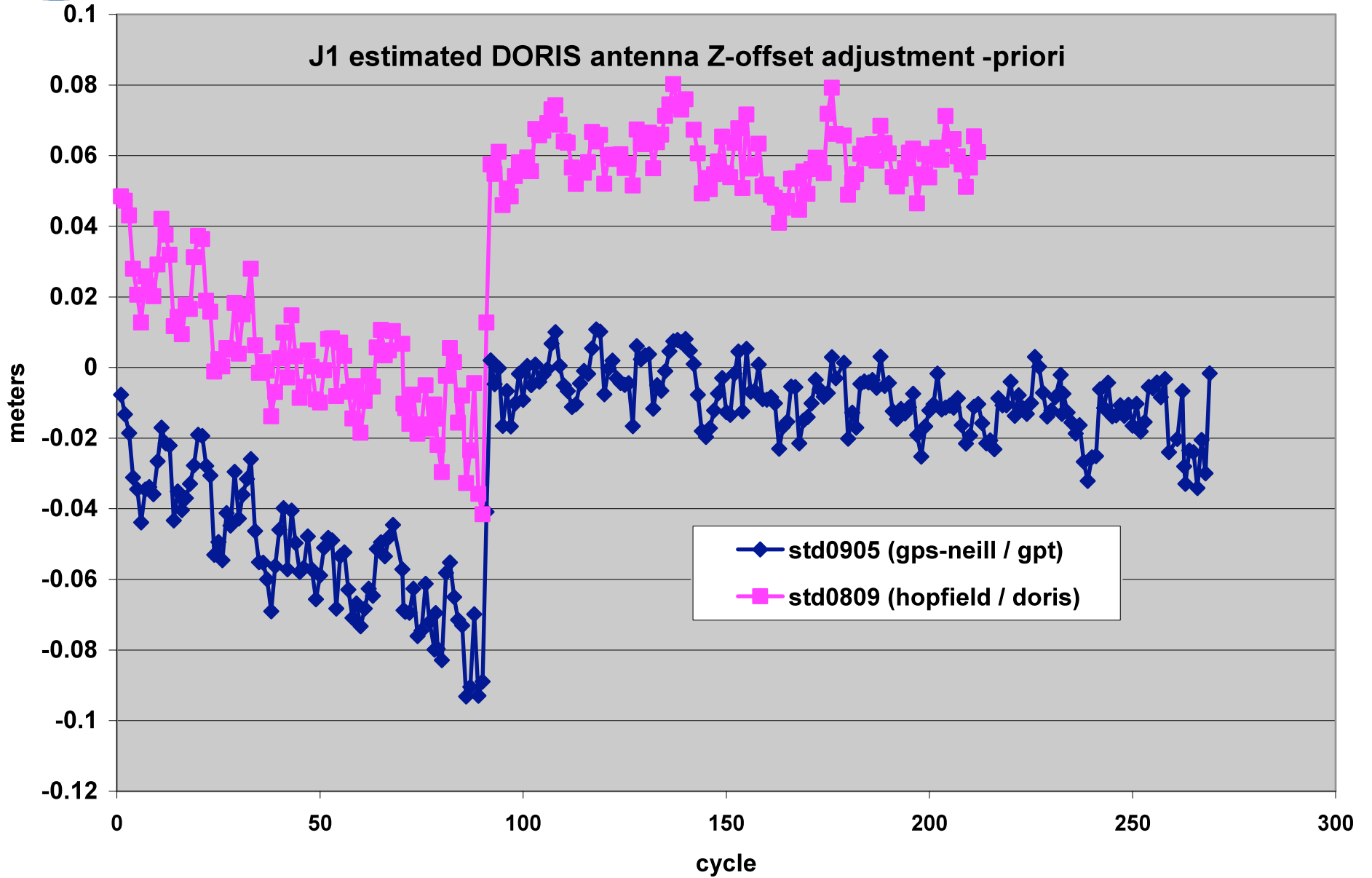


Jason-1 DORIS troposphere model tests

Jason-1 cycles 1-21 summary doris-only	residuals				orbit difference		
	doris (mm/s)	slr (cm)		xover (cm)	h (cm)	c (cm)	l (cm)
		mean	rms				
nominal: hopfield, doris met, est. wet+dry	0.3997	-0.135	2.621	5.761	---	---	---
gpt02: hopfield, gpt met, est. wet+dry	0.3991	-0.101	2.604	5.760	0.08	0.60	0.26
gpt02a: : hopfield, gpt met, est. wet	0.3998	-0.078	2.581	5.759	0.13	0.87	0.33

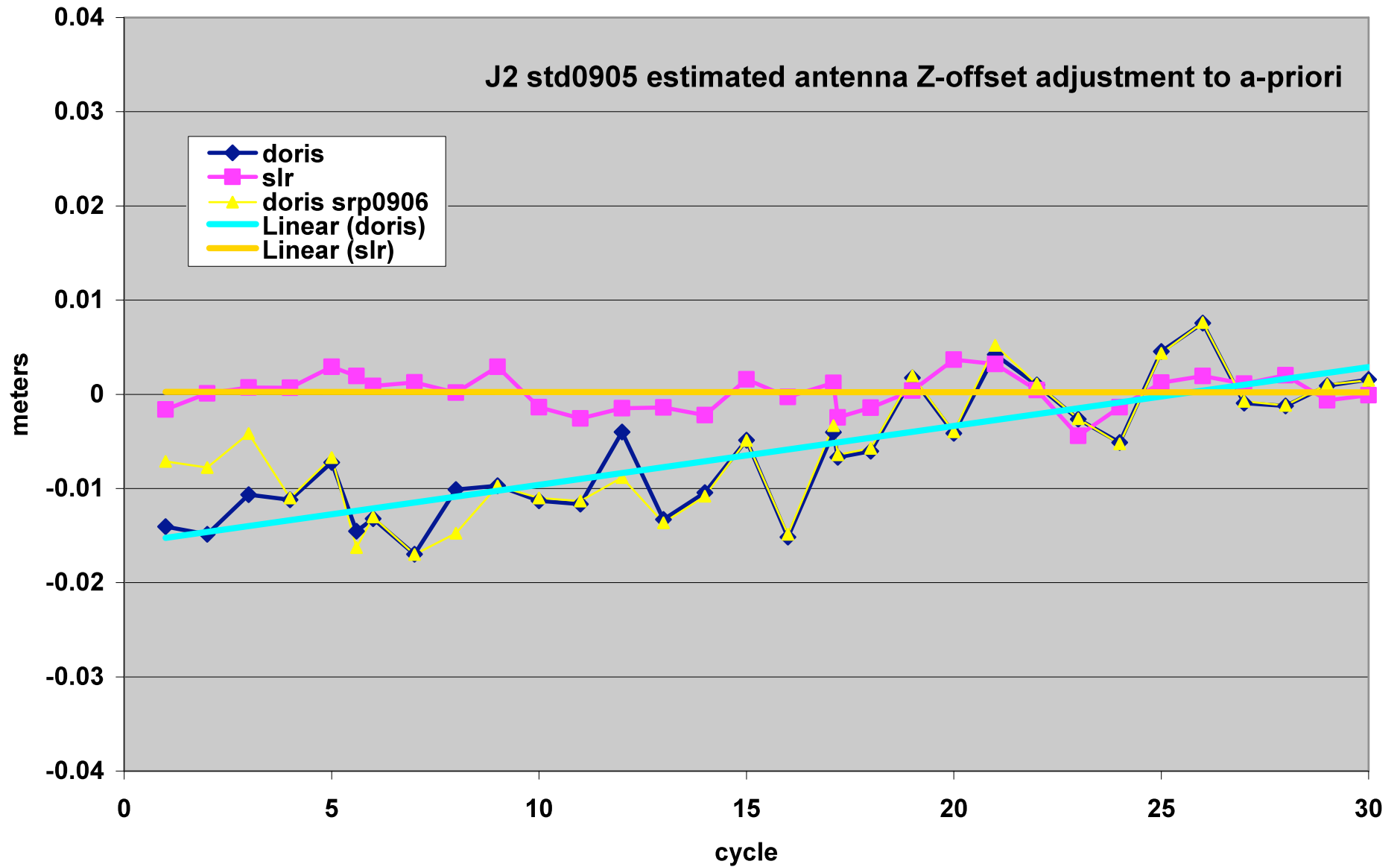


Jason-1 estimated DORIS antenna Z-offsets





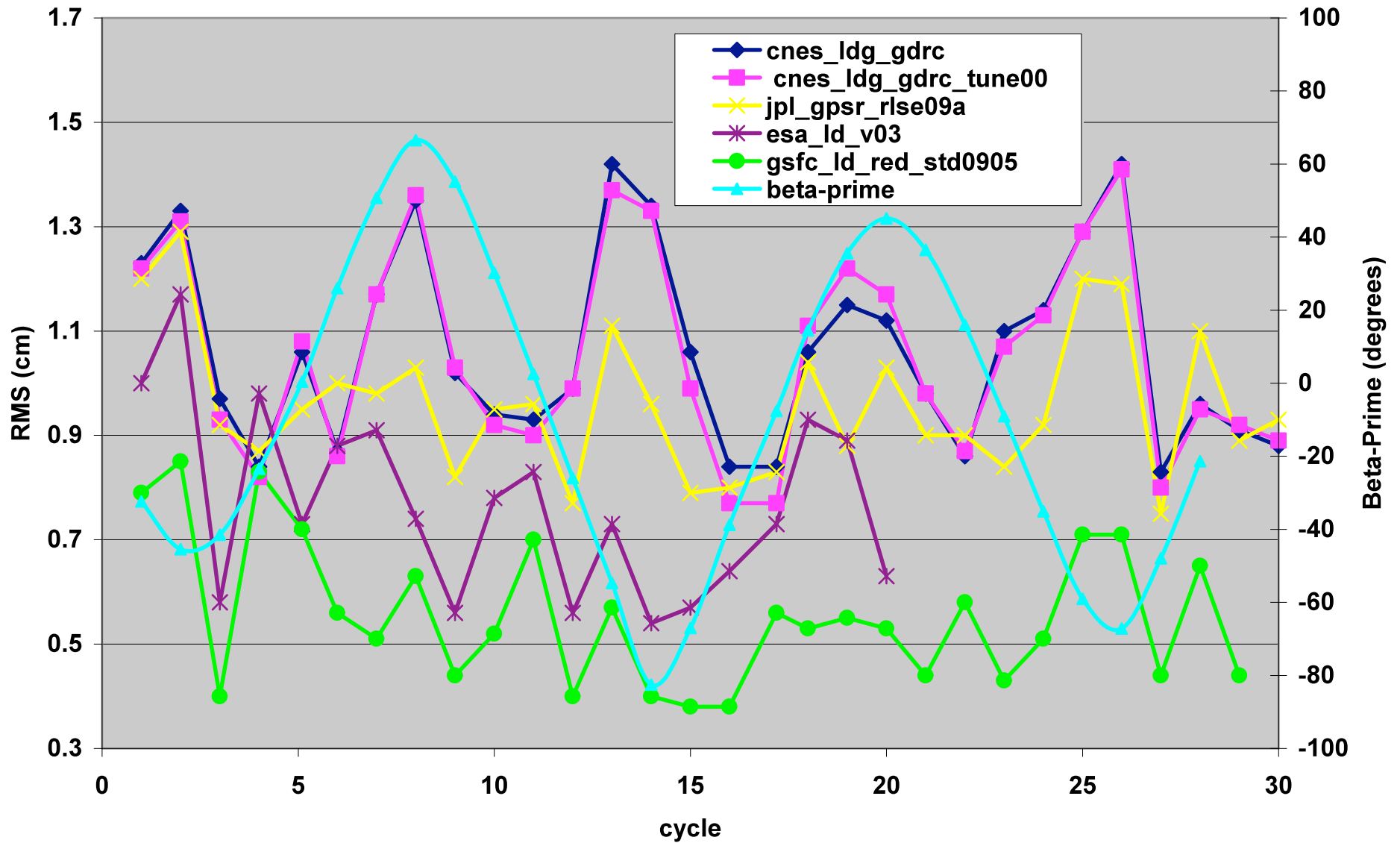
Jason-2 estimated DORIS antenna Z-offsets





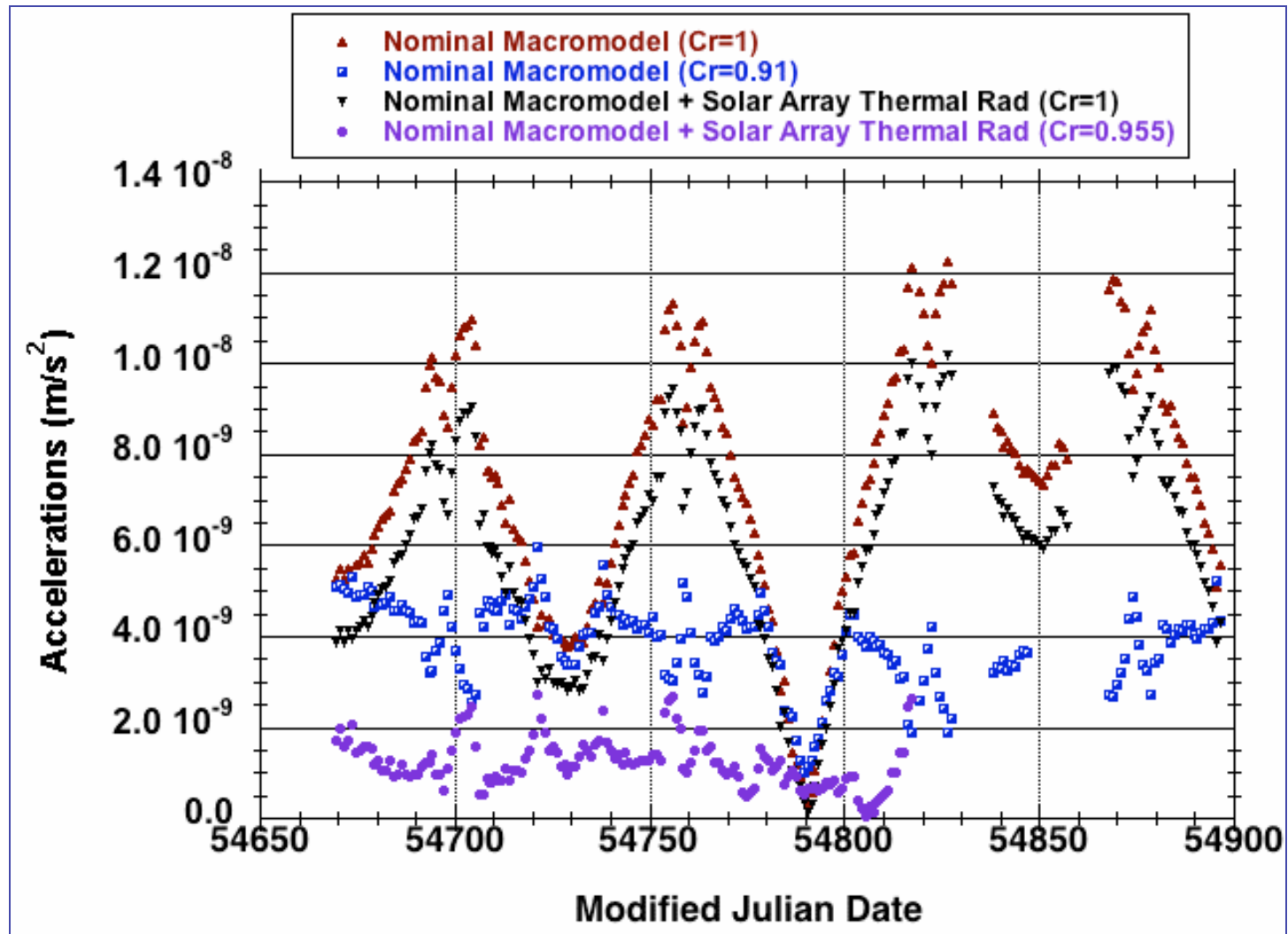
J2 orbit differences -wrt- GSFC dynamic orbit

Jason-2 radial difference -wrt- gsfc_ld_std0905 (dynamic) orbit





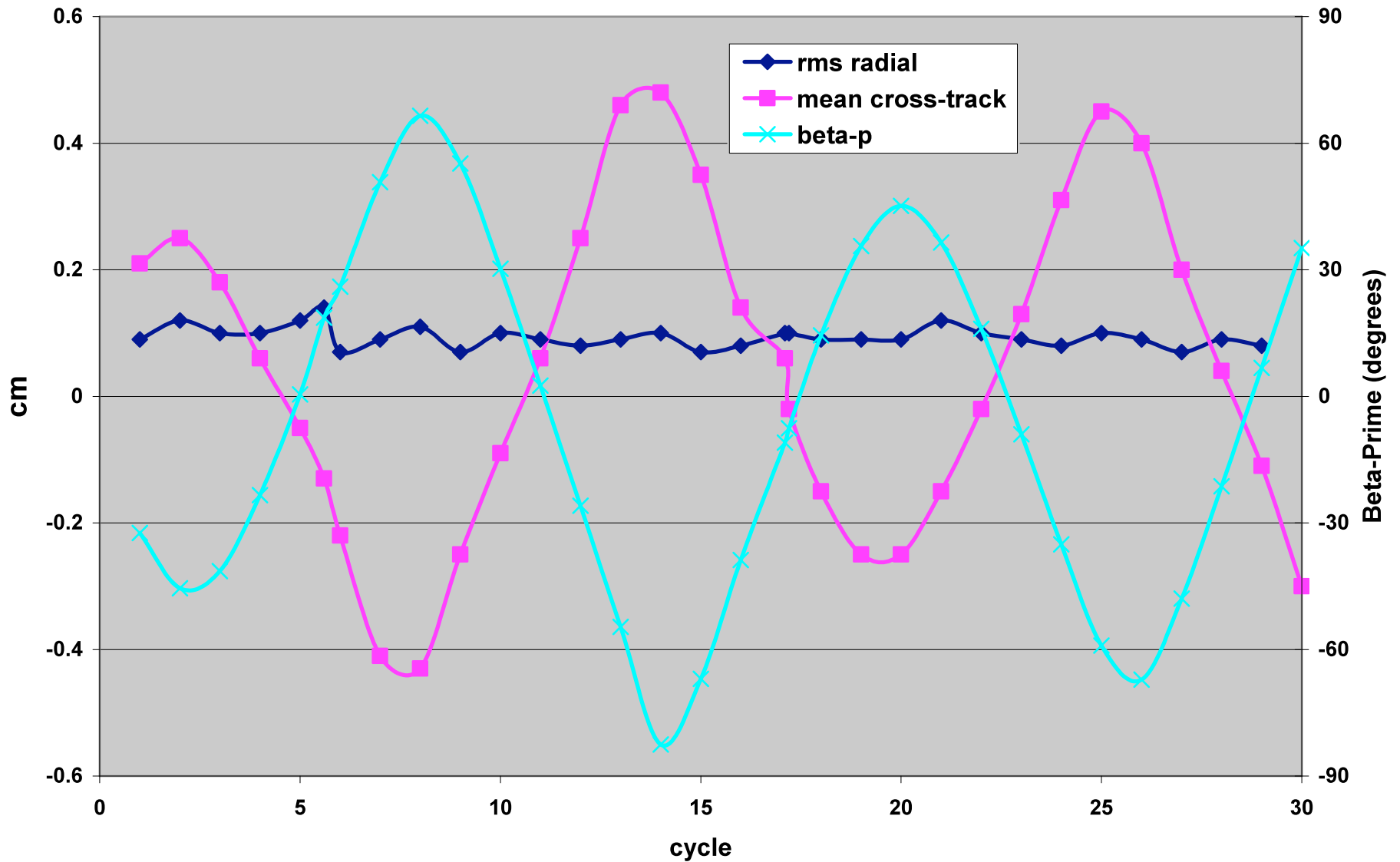
Daily Estimated Empirical Along-track Acceleration Amplitudes for Different J2 Macromodels (07/2008 – 03/2009)





J2 orbit difference between previous and new (srp0906) macromodels

Jason-2 std0905-srp0906 orbit difference





Summary

- J1 UCL improvement over panel model
- J1 SAA(3) improvement over intended period (c 261 →)
- J1 Residual TVG 2.5 mm annual amplitude as compared to total 5 mm amplitude using standard model
- DORIS
 - antenna Z-offset & GM estimates highly sensitive to troposphere error
 - antenna Z-offset estimate can diagnose problems with on-board oscillator
 - antenna Z-offset / GM estimates may referee improvements to troposphere modeling
 - DORIS met-data does not compare with GPT or SLR station values; GPT values improve POD
- J2 surface force modeling appears to be largest error source. Inclusion of thermal properties shows promise.



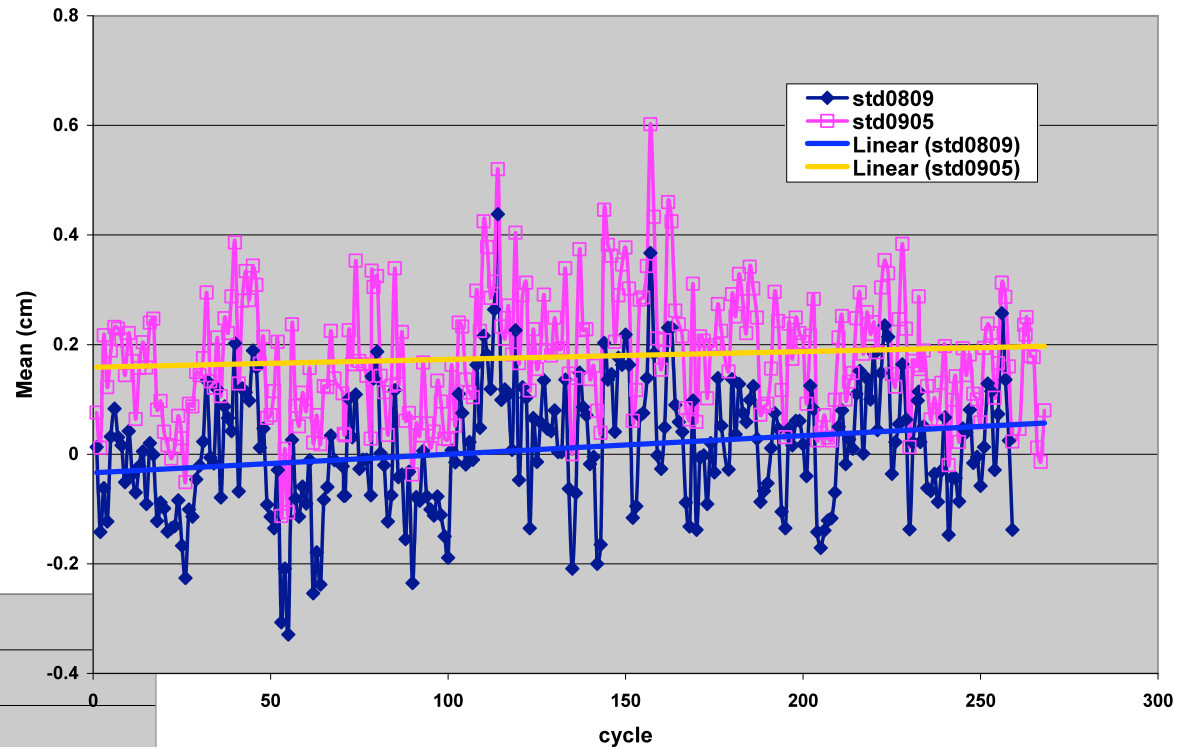
BACKUP



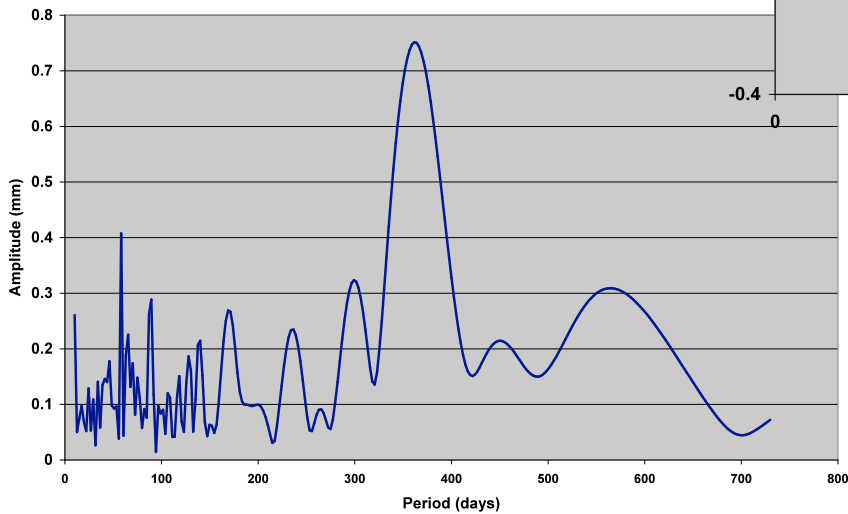


J1 SLR phase map removes offset – however a closer look may be warranted

Jason-1 SLR/DORIS solution SLR residuals

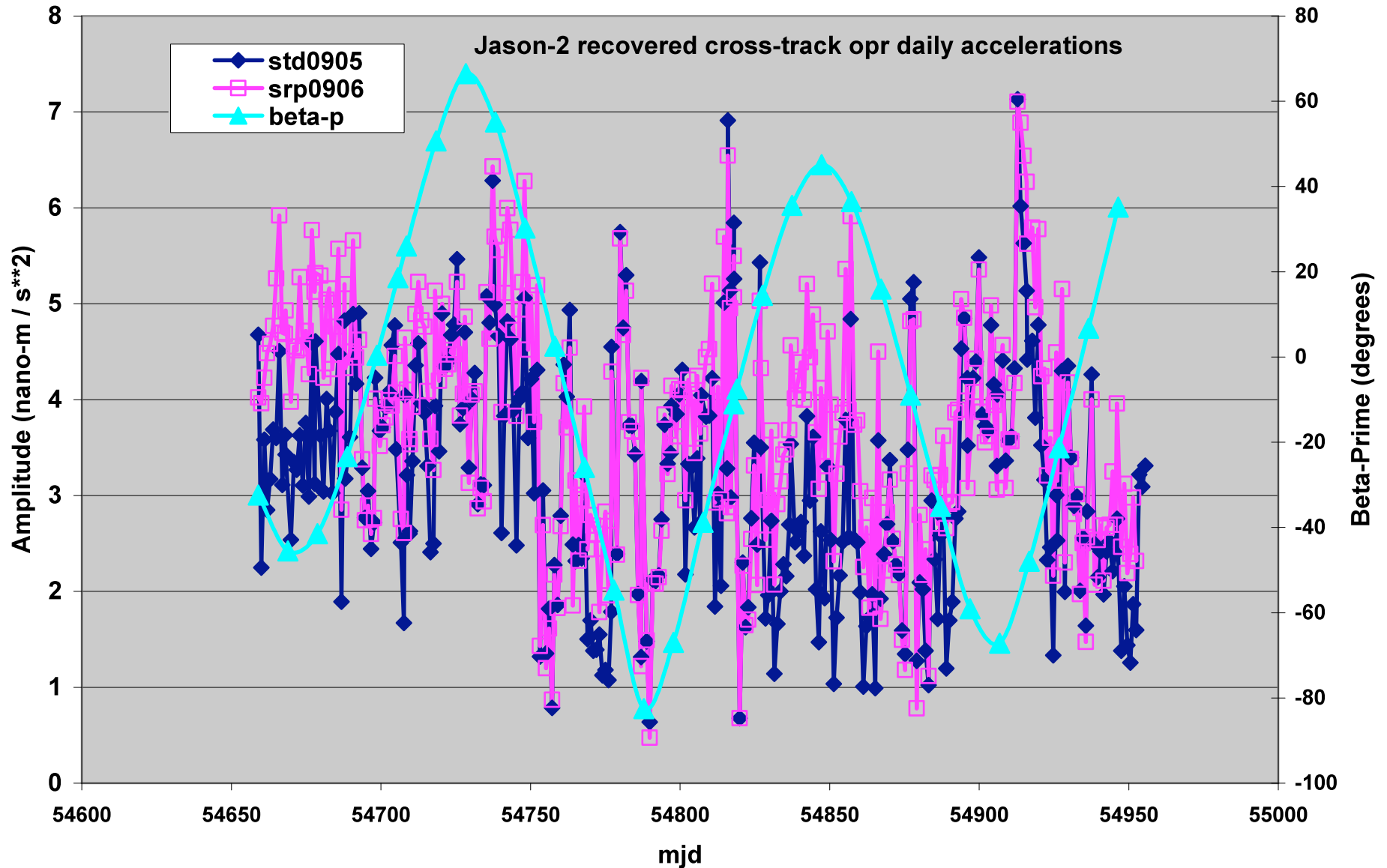


Periodogram Jason-1 mean SLR residuals cycles 1-259



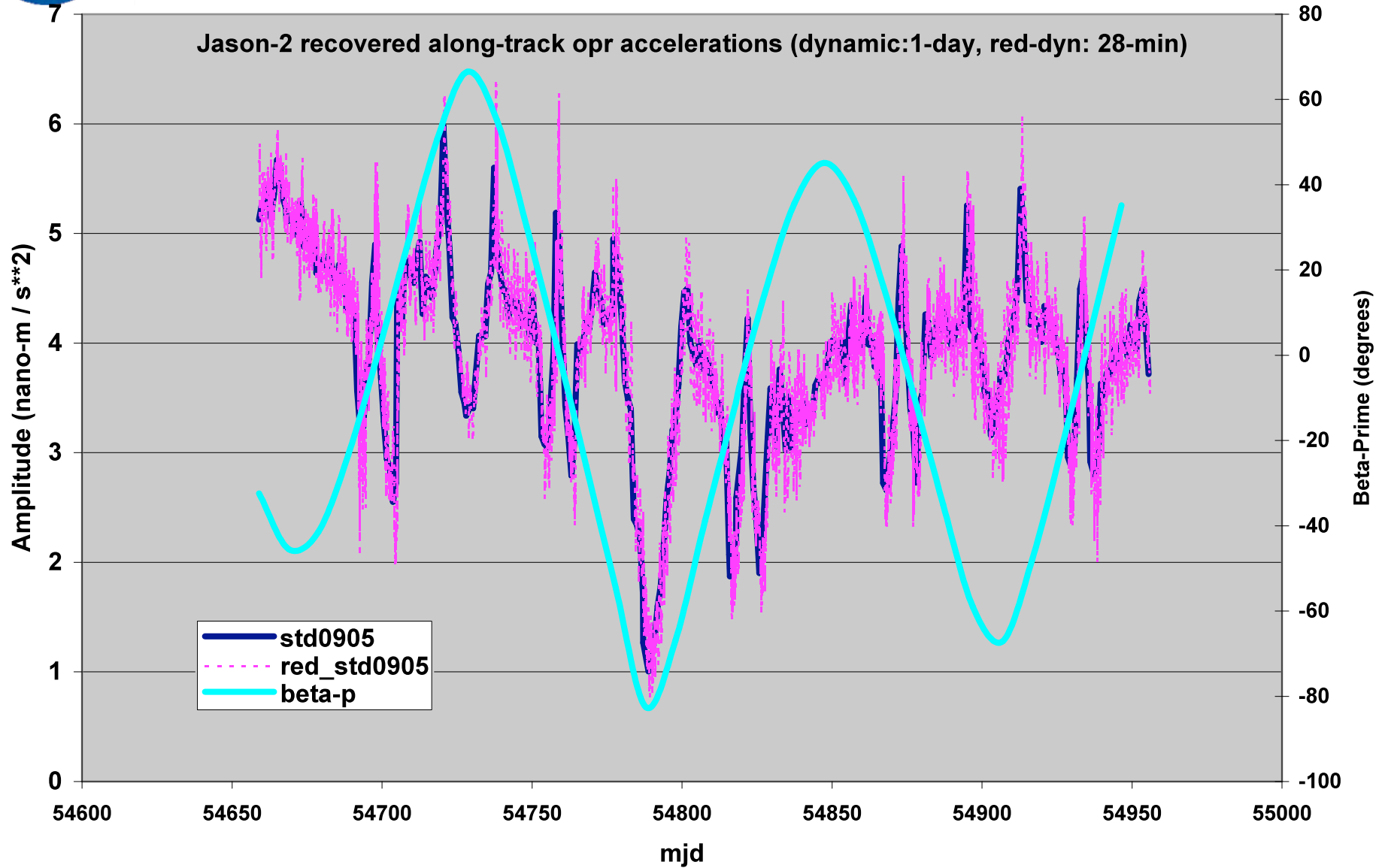


Daily Estimated Empirical Cross-track Accelerations for previous and new SRP models



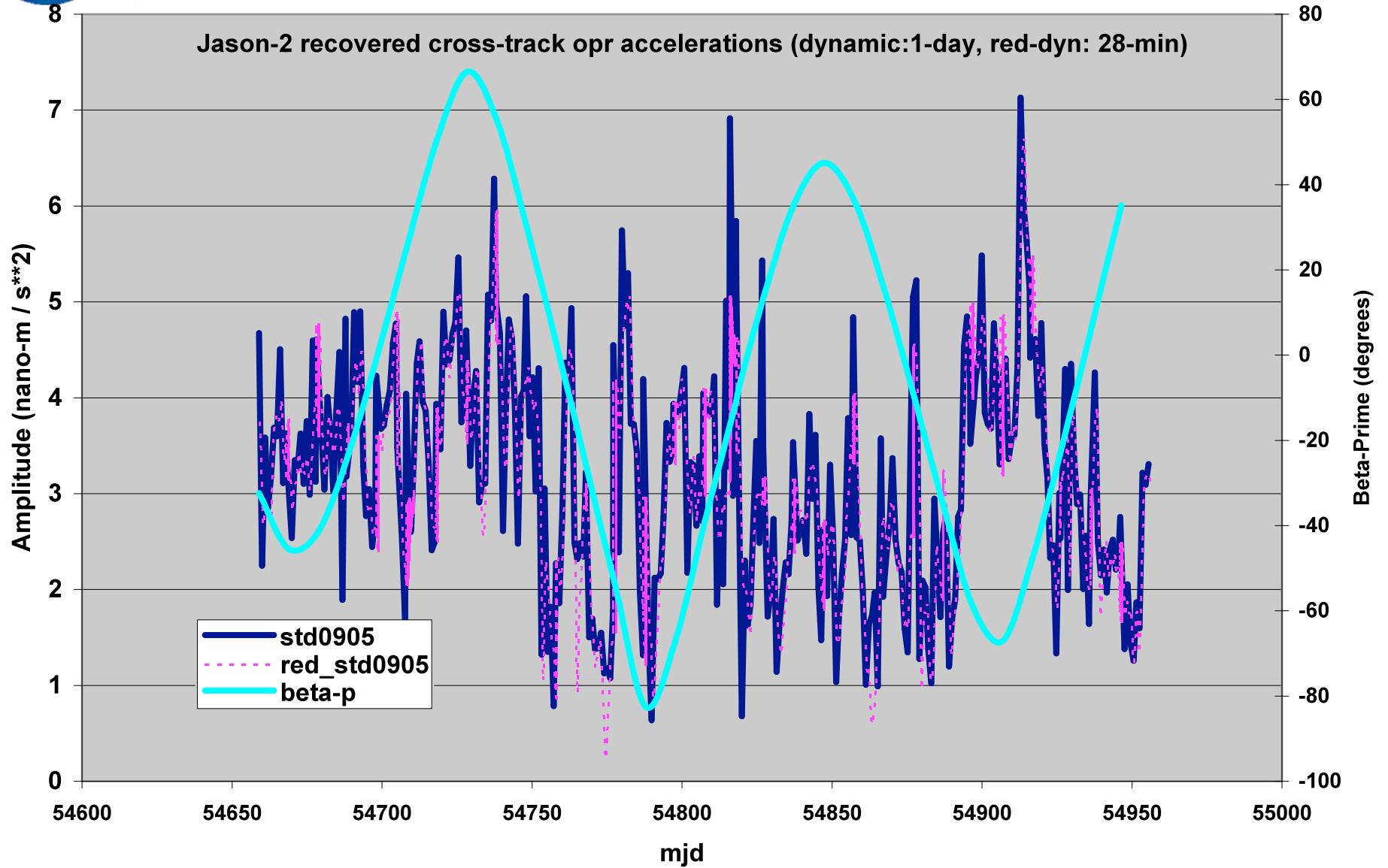


Estimated Empirical Along-track Accelerations



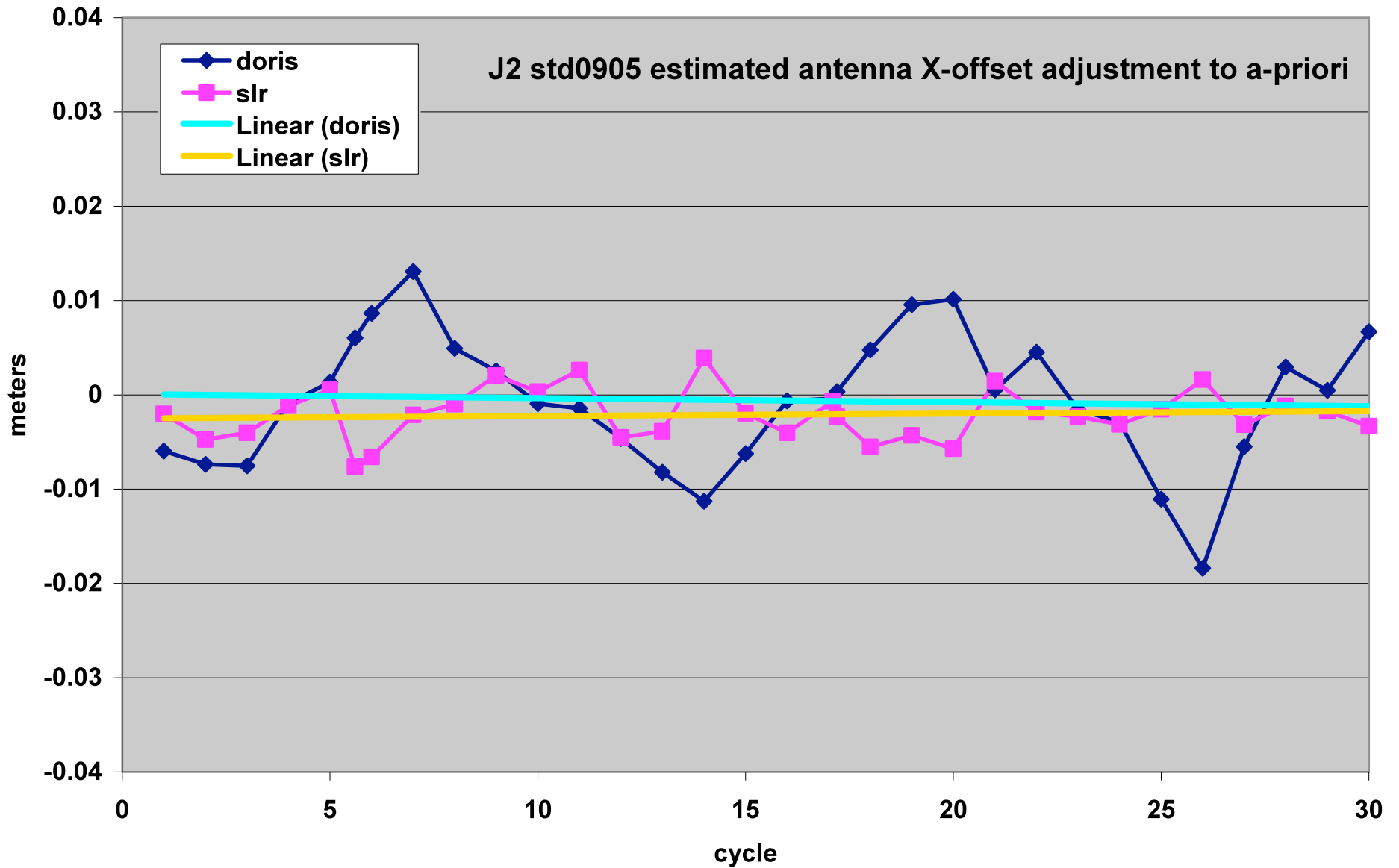


Estimated Empirical Cross-track Accelerations



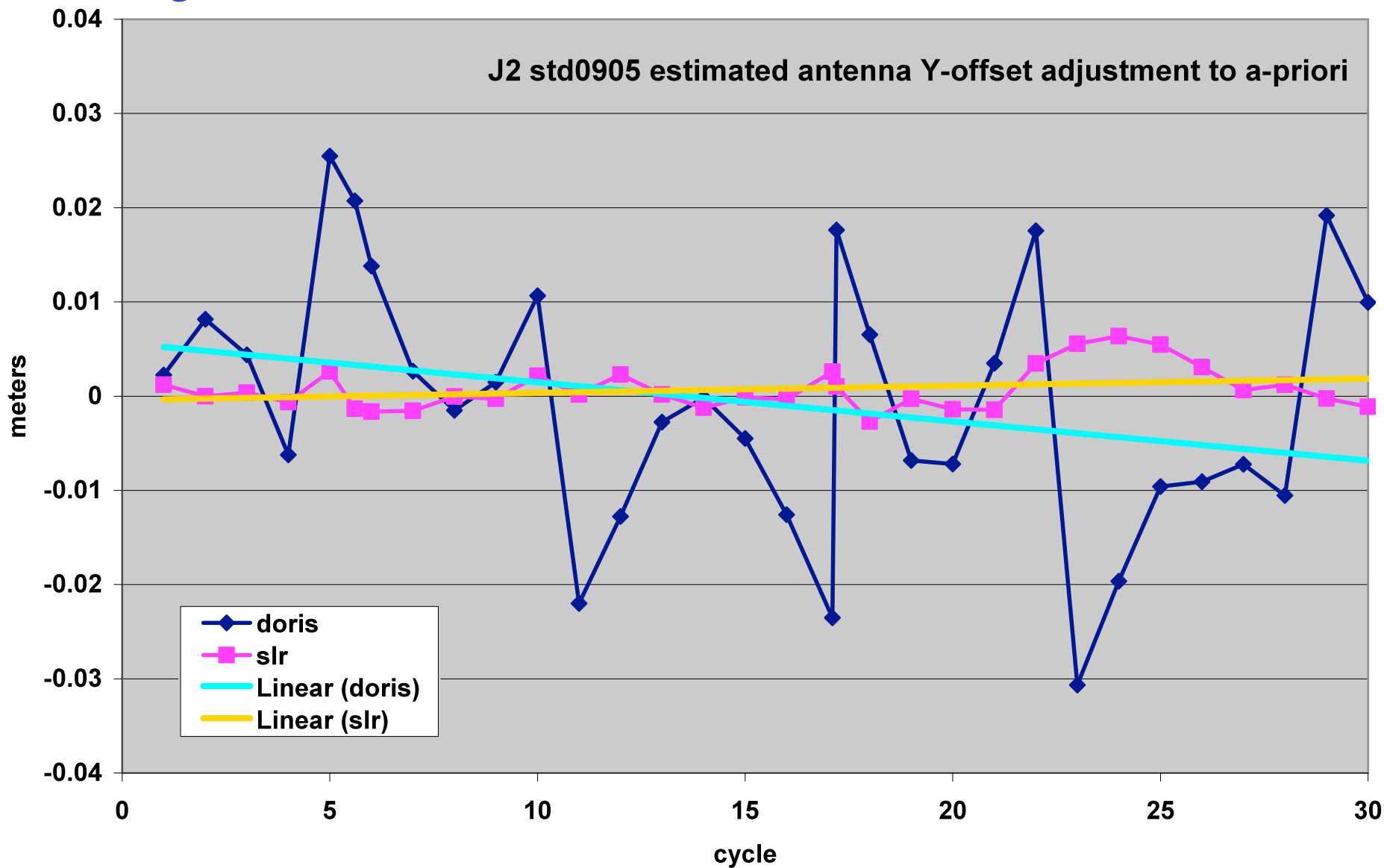


Jason-2 estimated DORIS antenna X-offsets





Jason-2 estimated DORIS antenna Y-offsets





Jason-2 DORIS new receiver: tracking

DORIS from CDDIS, J1/J2 Cycles 241/002

